demonstrated that tumor-infiltrating lymphocytes is a parameter suitable for predicting efficacy of 5-fluorouracil. In this case, efficacy was measured according to the endpoint of overall survival.

The following concerns the hypothesis that chemotherapy creates a natural anticancer vaccine. The Morris study proposed that cytotoxic chemotherapy is a potent activator of antitumor immune responses, and referred to the hypothesis that chemotherapy creates a wave of dead or dying tumor cells that enter the antigen presentation pathway. To reiterate this scenario, antigen presentation involves uptake of antigen by dendritic cells, processing of antigen by DCs to peptides, presentation of the peptides by DCs to T cells, and activation of antigen-specific clones of T cells.

e. Lymphocytes Can Kill Cancer Cells, but Lymphocytes Can Also Cause Cancer

As described above, tumor-infiltrating lymphocytes can be associated with a favorable outcome, as documented above in the studies of Galon et al. (79) and Morris et al. (80) in patients with colorectal cancer. On the other hand, lymphocytes infiltrating the gut on a chronic basis can cause colorectal cancer. This untoward effect of lymphocytes has been extensively documented in diseases of chronic inflammation of the gut, such as Crohn's disease and ulcerative colitis (81,82). Inflammatory bowel disease (Crohn's disease; ulcerative colitis) must exist for at least 7 years before the risk of colorectal cancer increases. Toxic oxygen produced by infiltrating lymphocytes and neutrophils induces the mutations found in cells of the gut, where these mutations occur in oncogenes such as *p53*, *KRAS*, and *adenomatous polyposis coli* (83,84). The end-result of accumulated mutations in the relevant oncogenes is colorectal cancer (85).

It might also be pointed out that patients with Crohn's disease and ulcerative colitis have elevated C-reactive protein (CRP). About 75% of Crohn's disease patients have elevated CRP, while 30% of ulcerative colitis patients have increased CRP (86). CRP, which is detailed at the end of this chapter, finds use as a biomarker.

II. METHODOLOGY TIP—MICROARRAYS

Microarrays are a tool for measuring large numbers of different biomarkers, for example,

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